# Synthesis of RDX

RDX, an acronym for Royal Demolition eXplosive, is a very powerful military explosive

or cyclonite, is a very insensitive high explosive compound. The actual chemical name is, although the chemical names are also used. RDX itself stands for and comes from Great Britain, cyclonite is the American usage, Hexogen is for Germans, and T4 is Italian. RDX can be stored for long periods of time and handled safely. RDX is usually mixed with other explosives and plasticizers to make a variety of useful compositions for military and civilian use, C-4 and Semtex are two such compounds. It seems so much RDX is made that most scientific books give industrial schematics for thousands of pounds instead of lab preparations. The laboratory methods here are not as efficient as in industry, but are fine. The first method uses methenamine, or hexamethylenetetramine, which can be purchased as heating tablets or synthesized in the lab. The second makes use of acetic anhydride, forbidden by the DEA, but it can be synthesized as well.

## PHYSICAL PROPERTIES

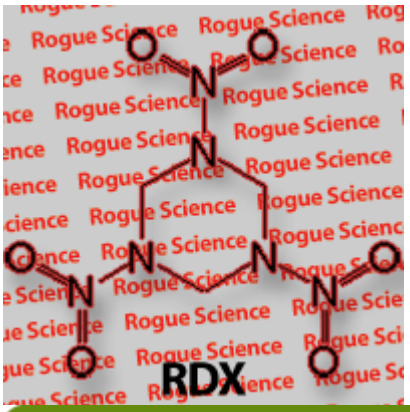
**$C_3H_6N_6O_6$**

| | | | | | |
|---|---|---|---|---|---|
| m.p. | 205 °C | mass | 222.12 g/mol | v.det. | 8500 m/s |
| b.p. | --- °C | den. | 1.82 g/mL | CAS# | 121-82-4 |

## SYNONYMS

- A 3
- Composition A 3
- CPX 301
- CX 84A
- Cyclonite
- cyclotrimethylenenitramine
- cyclotrimethylenetrinitramine
- cyclotrimethylene-trinitramine
- Giekfol
- Heksoflen
- hexahydro-1,3,5-trinitro-1,3,5-s-triazine
- hexahydro-1,3,5-trinitro-1,3,5-triazine
- hexahydro-1,3,5-trinitro-s-triazine
- Hexogen
- Hexogen 5W
- Hexolite
- A-IX 1
- A-IX 2
- NSC 312447
- PBX 9407
- PBX(AF) 108
- PBX-B 2238

- PBXC 116
- PBX-C 117
- PBX-L 3
- PBX-L 5
- PBX-MC
- PBX-MVF
- PBXN 107
- PBXN 107A
- PBXN 108
- PBXN 201
- PBXN 6
- PBXN 8
- PBXN(AF) 108
- PBX-W 108
- PBXW 108(E)
- PE 4
- PHX 34
- PMW 8
- RDX
- royal demolition explosive
- T4
- T4
- 1,3,5-triaza-1,3,5-trinitrocyclohexane
- 1,3,5-triazine, hexahydro-1,3,5-trinitro-
- s-triazine, hexahydro-1,3,5-trinitro- (8CI)
- sym-trimethylenetrinitramine
- trimethylenetrinitramine
- 1,3,5-trinitrohexahydro-1,3,5-triazine
- 1,3,5-trinitrohexahydro-p-triazine
- 1,3,5-trinitrohexahydro-s-triazine
- trinitrohexahydrotriazine
- 1,3,5-trinitroperhydro-1,3,5-triazine
- 1,3,5-trinitro-1,3,5-triazacyclohexane
- TS 1
- V 29




## 3D MOLECULAR STRUCTURE

## SYNTHESIS

Put 335 mL of 100% nitric acid in a 500-mL beaker, cool the acid to below 30 °C by setting the beaker in a salt-ice bath. The nitric acid must be as concentrated as possible, it must also be free of nitrogen oxides. Slowly add 75 g of methenamine in small portions to the acid while stirring. The temperature must be kept between 20 °C to 30 °C during the addition. Once all of the methenamine has dissolved, slowly heat it to 55 °C while stirring, hold it to between 50-55 °C for 5 minutes, keep stirring. Now cool the mix to 20 °C then let it sit for 15 minutes. After standing, it is gradually diluted with three or four times its volume of cool water, this should precipitate the RDX from solution. Depending on how the gods of chemistry feel about your reaction it may take from minutes to hours to fully precipitate all of the RDX. Decant most of the liquid then add 1 L of 5% sodium bicarbonate solution to neutralize the remaining acid. Filter the mixture to collect the crystals of RDX that should have formed. Wash them with cold water, then with hot 5% sodium bicarbonate solution, and again with water. The RDX can be dried at room temperature or in an oven. Further purification can be accomplished by recrystallizing from acetone. You will need a graduated cylinder for measuring liquids, a stirring rod or magnetic stirrer for mixing, and a thermometer to monitor the temperature.

The second procedure is as follows: Place 260 mL acetic anhydride in a 1000-mL beaker and add 105 g powdered ammonium nitrate while stirring. Heat the beaker to 90 °C and remove the source of heat. Very slowly add 38 g of paraformaldehyde to the beaker, this addition will release toxic and flammable fumes, use a fume hood or go to an open area. After the addition, add the

contents of the beaker to twice its volume of cold water to precipitate crystals of RDX. Filter the solution to collect the crystals and wash them with cold water then boiling water. The RDX can be purified by dissolving in the minimum amount of acetone then diluting with cold water. Filter the crystals to collect them and allow to dry in the open air.

While a good faith effort has been made to ensure the accuracy of all scientific information presented on this page, the possibility exists that some errors have invaded the machine. Furthermore, there may be certain omissions of physical properties, reaction conditions, necessary equipment, storage and handling requirements, and critical safety data. As with any scientific endeavor, especially chemistry, the necessary safety precautions should be observed at all times.

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